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**Faunistic notes on some Hydradeephaga from the Khuzestan,
Hormozgan and Sistan & Baluchestan provinces in Iran,
with descriptive notes on the female of
Glareadessus franzi WEWALKA & BISTRÖM 1998
(Coleoptera, Dytiscidae, Noteridae)**

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Abstract: So far only a single male, the holotype, of *Glareadessus franzi* WEWALKA & BISTRÖM 1998 was known to science, found at light in Kerman province in south-eastern Iran. Not far from the locus typicus three females of this species have been found recently by means of a pump in the interstitial region of two rivers in the Hormozgan province. The female genitalia are illustrated and some additional descriptive notes are given. The DNA of one specimen was extracted and two sequences deposited in Genbank. *Glareadessus stocki* WEWALKA & BISTRÖM 1998, the second member of the genus, known from Oman and the United Arab Emirates, is also briefly treated. Some other interesting Hydradeephaga are recorded from Iran (Khuzestan and Sistan & Baluchestan provinces), some of which are first records from that country: *Hyphoporus solieri* (AUBÉ 1838), *Laccophilus flexuosus* AUBÉ 1838, and *Canthydrus laetabilis* (WALKER 1858). *Hygrotus orthogrammus* (SHARP 1882) has already been recorded from Iran, however, it is also discussed here, since it remains poorly known. Several photos of the habitus of the species and of the collecting sites, as well as a distribution map are provided.

Key words: Coleoptera, Dytiscidae, Noteridae, *Glareadessus*, *Laccophilus*, *Canthydrus*, *Hyphoporus*, Iran, description, first record, DNA.

Introduction

In the years 2010 and 2011 two of the authors collected insects (Coleoptera) and water mites (Acari) in Iran, each independently from each other – I. Darvishzadeh in the western province Khuzestan, and V. Pešić in the south-eastern provinces Hormozgan and Sistan & Baluchestan. The most interesting collecting results with respect to Hydradeephaga are presented here, some of these being first records for Iran. The habitus of these species are illustrated and the female genitalia of *Glareadessus franzi* WEWALKA & BISTRÖM 1998 are figured for the first time. While the second member of the genus – *Glareadessus stocki* WEWALKA & BISTRÖM 1998 – was found in the years 1996 and 1998 in the groundwater of wadis in Oman and, thus, at that time it was classified a subterranean species, of the other one so far only as a single male was known, which was

found in 1974 in the Iranian Kerman province at light. Wewalka and Biström assumed that this species should be also subterranean, mostly due to the external morphological similarity to *G. stocki*, and our records seem to support this view. However, the data published in ALARIE & WEWALKA (2001: 149) and HÁJEK & BRANCUCCI (2011) show that it should be more appropriate to assume semi-subterranean habits.

Material and methods

The second author spent one week collecting in July 2011 in south-eastern Iran. His main interest was in water mites (Acari: Hydrachnidia) (see PEŠIĆ et al. 2012), however, a large number of other invertebrates were also found. Most beetles were collected by the traditional method (hand net), however, *G. franzi* was found when searching for Acari in the hyporheic zone beside streams. This was either done by means of an adapted Bou-Rouch pump (see BOULTON et al. 1992) or using the Karaman-Chappuis method by digging a hollow into the sediment down to the groundwater level, allowing water to fill the bottom of the pit, then collecting the water with a dish and filtering it through a plankton net (cf. PEŠIĆ et al. 2012: 5). All specimens were preserved in ethanol.

The female genitalia of *G. franzi* were studied wet with an Olympus SZX16 stereomicroscope. Photos of the habitus were taken with a Nikon Coolpix 995 camera attached to the stereomicroscope and then treated with CombineZM Image Stacking Software. The female genitalia of both *Glareadessus* species have been studied with an Olympus BH2 microscope. All recently collected specimens provided in this work are stored in the collection of the senior author (CHF) which is property of the Naturhistorisches Museum Wien, Vienna, Austria (NMW). Authors' remarks and complementary data are given in square brackets. Under each species we provide a selection of references (which is by far not complete). The map in Fig. 23 was made by using "Microsoft Encarta World Atlas 2000".

Taxonomy

Glareadessus franzi WEWALKA & BISTRÖM 1998

Glareadessus franzi WEWALKA & BISTRÖM 1998: 62 (original description); NILSSON 2012 (distribution).

So far this species was known only from the male holotype (Fig. 1) which is stored in the NMW. The holotype was collected at light; the label data are: "Iran – 2.5.1974 Manujan [= Manoojān, in Kerman province; ca. 27.4N 57.5E; triangle (3) in Fig. 23], 110 km E Bandarabess (26), leg. Pretzmann, Lichtfang [light trap], Exp. Nat. Hist. Mus. Vind." [printed], a male sex-symbol, "Holotypus, *Glareadessus franzi* sp.n., Wew. & Bistr. [19]98" [red, printed]. The abdomen, the median lobe and the parameres are glued behind the specimen on the same card. The holotype is rather fragile (and probably slightly immature) and, thus, we did not unglue the specimen to study its underside or other details.

Vladimir Pešić collected two females (Fig. 2) by means of a pump in the river Rudan in the Hormozgan province (= Ostān-e Hormozgān) in south-eastern Iran (triangle (2) in

Fig 23). The label data are: "21.7.2011 Iran, Hormozgan prov., NE Bandar Abbas, ca. 5 km ENE Rudan (Roodān), Rudan stream, 27.4771N 57.2578E, alt. 210 m, pump in gravels, Pešić leg. (IR22)", "*Glareadessus franzi* Wewalka & Biström, Fery det. 2011" (CHF). This collecting site is illustrated in Fig. 21; it is situated only about 25 km west of the type locality. A comparison with a photo of the locus typicus in WEWALKA & BISTRÖM (1998: 63; fig. 12) shows that both localities appear rather similar. Another female has been found (also by means of a pump) ca. 60 km WNW of Rudan (triangle (1) in Fig. 23; the collecting site is illustrated in Figs 19 and 20); the label data are: "18.7.2011 Iran, Hormozgan prov., N Bandar Abass, Banglayan village, stream, 27.7616N 56.5400E, alt. 577 m, pump in gravels, Pešić leg. (IR19)", the DNA extraction voucher number "IBE-RA 640" and "parts of abdomen lost due to sequencing" and the same determination label as above (CHF).

The description of both *Glareadessus* by WEWALKA & BISTRÖM (1998) is fully appropriate, in particular, they did not report that the male protarsomeres are dilated (compared to those of females). We can confirm that these are not dilated, however, want to add another observation: The first three protarsomeres of the females of *G. franzi* are provided with setae each of which are distally slightly enlarged to a small sucker cup ("sucking setae"). A few more distally placed setae on the first and second tarsomeres seem to be more strongly enlarged and elongated and reach to the proximal part of the following tarsomere. The sucker cups are imperceptible if the specimens are dry. The protarsomeres must be clean, the specimens kept for a while in water (preferably, afterwards additionally for a while in ethanol) and even then are still difficult to observe. A microscope with high magnification is needed (ca. x 200) and the tarsomeres must be illuminated in an appropriate orientation. We did not study the fragile male holotype of *G. franzi*, but found similar setae in the females and males of *G. stocki*, those of the males appearing slightly larger. The cups are too small to be photographed with our equipment. The few specimens which were at our disposal did not allow us to study these structures using an SEM (scanning electron microscope), and the need for wet specimens would really preclude this technique. To our knowledge sucker setae have never been reported for Bidessini (also not in the revision by BISTRÖM 1988) except in LARSON et al. (2000: 101) who state in the case of North-American Bidessini: "Male pro-and mesotarsomeres 1 to 3 narrowly dilated and ventrally bearing several adhesive setae in most species."

We have not been able to find significant differences in extern characters between the male holotype from Manujan and the two females found at Rudan, except the shape of the pronotum. In both sexes it is more or less cordiform because the side margins are sinuate before the posterior angles (in contrast to *G. stocki*; cf. Figs 4-5), however, these angles are more or less rectangular in both females whereas they are slightly acute in the holotype (cf. Figs 1-2). On the other hand the female from Banglayan is larger (and somewhat darker) and has the posterior angles of the pronotum distinctly more acute than the other females (even more than the male holotype), thus, the pronotum appears more cordiform (Fig. 3). We can not exclude the possibility that this specimen belongs to a closely related, but still unknown species. Without having a larger series of specimens, and in particular without males, we refrain from describing a new species at present.

The female genitalia of both *Glareadessus* have not been figured so far. A gonocoxosternum and a gonocoxa are given in Figs 6 and 7 for *G. franzi* and in Figs 8 and 9 for *G.*

stocki. It has been rather difficult to prepare these small structures, and, thus, some details may have been overlooked or misinterpreted. Additionally, the shape of the gonocoxosterna seems to be somewhat variable (even those of a single specimen appeared not necessarily identical). The blade of the gonocoxae, however, has been found in all females studied to be longer in *G. franzi* than in *G. stocki*. The female genitalia of both species do not deviate considerably from those of other Bidessini studied (cf. the illustrations of the genitalia of members of the *Bidessus minutissimus*-group given in FERY 1992).

DNA: The DNA of the specimen from Banglayan (voucher number IBE-RA 640) was extracted by colleague I. Ribera (Barcelona, Spain) using commercial column kits. Two fragments of the cytochrome oxydase 1 (cox1) were sequenced: one from the 5' end with primers LCO1490-HCO2198 (the "barcode" fragment, HEBERT et al. 2003), and the second from the 3' end with primers jerry-pat (SIMON et al. 1994). Both sequences have been deposited in Genbank with accession numbers HE980448 and HE980449.

Notes: Whilst so far only four specimens of *G. franzi* exist in collections, there are many specimens of *G. stocki* in several collections. This species originally has been described from three localities in Oman (WEWALKA & BISTRÖM 1998: 61), but was recently also found in high number at several localities in the United Arab Emirates [= UEA] (HÁJEK & BRANCUCCI 2011: 132) (Fig. 23; locus typicus: empty circle; other localities: filled circles; one locality in southern Oman is not included in the map (ca. 800 [!] km SW of the locus typicus, between Šalālah and Mirbāṭ, near the border to Yemen); here three paratypes have been found.). The specimens have been collected at the Oman sites in the groundwater of wadis by means of a pump, between gravels in ca. 1 m depth. In the UEA the species was found mostly in light traps, however, also in Malaise and water traps and not in the underground, but in streams and in a pool. Thus, the characterisation of *G. stocki* as a "predominantly subterranean" (WEWALKA & BISTRÖM 1998: 61) species should be related; possibly, the term "semi-subterranean" is more appropriate. Further collecting actions might reveal that also *G. franzi* must be treated as a semi-subterranean species.

Notes: The larva of *G. franzi* so far is unknown, however that of *G. stocki* has been described by ALARIE & WEWALKA (2001).

***Hygrotus orthogrammus* (SHARP 1882)**

Coelambus orthogrammus SHARP 1882: 405 (original description).

Coelambus lernaues var. *orthogrammus* SHARP 1882: ZIMMERMANN 1930: 101.

Coelambus lernaues (SCHAUM 1857): GUIGNOT 1959a: 332; HOSSEINIE 1976: 169; ALI 1978: 12; FRANCISCOLO 1979: 310; NILSSON 2001: 207 (catalogue).

Hygrotus lernaues (SCHAUM 1857): AL-HOUTY & ANGUS 1999: 184 (new combination).

Hygrotus orthogrammus (SHARP 1882): FERY et al. 2005: 36 (re-instatement, re-description, distribution); NILSSON & FERY 2006: 60 (catalogue); NILSSON 2012 (distribution).

This species has been treated for a long period as junior subjective synonym of *Hygrotus lernaues* (SCHAUM 1857) (e.g. GUIGNOT 1959a: 332; FRANCISCOLO 1979: 310; NILSSON 2001: 207) or as variety of the latter (e.g. ZIMMERMANN 1930: 101) or misinterpreted as this species (HOSSEINIE 1976: 169; ALI 1978: 12; AL-HOUTY & ANGUS 1999: 184). FERY et al. (2005) re-instated this taxon as valid species. It is indeed externally very similar to *H. lernaues*, on the other hand both are easily to separate by the shape of the prosternal

process which is almost flat in *H. orthogrammus*, but distinctly carinate in *H. lernaeus*; the shape of the female gonocoxae is also specifically different (FERY et al. 2005: 40, figs 12 and 13). The species is well-known from Iraq, Kuwait, Saudi Arabia and also from the Khuzestan province (among others) in Iran (FERY et al. 2005: 37; NILSSON 2012: 43). Although the following record is not the first one for Iran, it is included here because it completes well the older records of this little known species: 1♂, 1♀, "6.12.2010 Iran, Khuzestan, 10 km N Bandare Emam, ca. 30.58N 49.05E, altitude 21 m, basin, Darvishzadeh leg." (CHF) (Fig. 23; square 2). A photo of the habitus of this species is provided here for the first time (Fig. 13). The specimens were found together with *Herophydrus musicus* (KLUG 1834) and *Hydaticus ponticus* SHARP 1882.

***Hyphoporus solieri* (AUBÉ 1838)**

Hydroporus solieri AUBÉ 1838: 554 (original description); SHARP 1882: 391.

Hyphoporus solieri (AUBÉ 1838): RÉGIMBART 1895: 37; ZIMMERMANN 1920: 73; 1930: 115; GUIGNOT 1959a: 337; ALFIERI 1976: 33; AL-HOUTY & ANGUS 1999: 184; ZALAT et al. 2000: 28; NILSSON 2012 (distribution).

This species has been described by AUBÉ (1838: 554) from "Égypte" (African part and Sinai). So far it was, additionally, known from Kuwait and Saudi Arabia (NILSSON 2012). SHARP (1882: 391) gave also the areas "Persia" and "northern India" which later on, however, have not been accepted by any author and are most probably due to a misidentification of another species. We can report the following record from close to the Iraqi border: 4♂♂, 4♀♀, "12.9.2010 Iran, Khuzestan, 8 km SE Abadan, altitude 8 m, Darvishzadeh leg., ca. 30.29N 48.36E, pond" (CHF) (Fig. 23; square 1). This is the first record of *H. solieri* from Iran. To our knowledge a photo of the habitus of this species has never been provided before (Fig. 14).

Notes: We could not recognise extern morphological differences to specimens from Egypt; the male genitalia also equal those of Egyptian specimens. It seems to be likely that the species occur also in the southern parts of Iraq.

***Laccophilus flexuosus* AUBÉ 1838**

Laccophilus flexuosus AUBÉ 1838: 430 (original description); SHARP 1873: 53; 1882: 310 (misidentification); RÉGIMBART 1889: 151; 1899: 256; ZIMMERMANN 1920: 18; 1930: 115; GUIGNOT 1959b: 11; VAZIRANI 1977: 12; BRANCUCCI 1983: 318 (description, distribution); HÁJEK, J. 2003: 117; HÁJEK & ŠTASTNÝ 2005: 56; GHOSH et al. 2011: 9; NILSSON 2012 (distribution).

This species was described by AUBÉ (1838: 430) from "Pondichéry" (= Pondicherry or Puducherry, in southern India (Oriental zoogeographical region); ca. 11.93N 79.78E). SHARP (1873: 53; 1882: 310) recorded under this name a species from "Mesopotamia" [more or less identical with today's Iraq] and "Persia" [= Iran] (among other countries) which later on RÉGIMBART (1889: 151) identified as another species which that author described as *Laccophilus sharpi* in the same publication. Some confusion about the distribution of *L. flexuosus* might have come up because VAZIRANI (1977: 12) provided as distribution area "from Iraq to Japan-Iran", however, most probably by citing only Sharp's data from 1882.

Laccophilus sharpi belongs to the *complicatus*-group of the genus (BRANCUCCI 1983: 346), while *L. flexuosus* is a member of the *chinensis*-group (l.c. p. 315). The latter

species was recorded by BRANCUCCI (l.c. p. 318) from Cambodia, China, India, Japan, Myanmar, Nepal, Sri Lanka and Vietnam. It was recorded also from Pakistan by GUIGNOT (1959b: 11) and for the first time from Laos by HÁJEK & ŠŤASTNÝ (2005: 56). All these countries are also given in NILSSON (2012). Both species (identity checked by us via study of the median lobe) have been found together in the same pool (Fig. 22; together with *Hydroglyphus angularis* (KLUG 1834), and *Canthydrus laetabilis* (WALKER 1858) – see below) near the border to Pakistan, in the Sistan & Baluchestan province (= Ostān-e Sīstān-o Balūchestān): 1 ♂, 1 ♀, "13.7.2011 Iran, Seistan, Chabahar, Guerduig vill., 5 km to Koch vill., pool, 25°46.084N 60°54.968E, Pešić leg. IR5" (Fig. 23; asterisk). *Laccophilus flexuosus* (Fig. 16) resembles not only *L. sharpi* (Fig. 17), but also somewhat paler individuals of the widely distributed *Laccophilus poecilus* KLUG 1843 (*chinensis*-group) (Fig. 18). All three species occur in Iran. They can easily be distinguished by the shape of their median lobes (Figs 10-12). This is the f i r s t (reliable) r e c o r d of *L. flexuosus* from Iran.

N o t e s : The collecting site (a pool) is well recognisable with Google-Earth (accessed in July 2012).

***Canthydrus laetabilis* (WALKER 1858)**

Hydroporus laetabilis WALKER 1858: 205 (original description).

Canthydrus laetabilis (WALKER 1858): SHARP 1882: 277; RÉGIMBART 1899: 250; ZIMMERMANN 1920: 11; VAZIRANI 1977: 6; TOLEDO 2008: 65; GHOSH et al. 2011: 9; NILSSON 2012 (distribution).

This member of the family Noteridae was described by WALKER (1858: 205) from Ceylon (Sri Lanka) in the dytiscid genus *Hydroporus* CLAIRVILLE 1806. So far it was only known from the Oriental zoogeographic region (Bangladesh, India, Myanmar) and from India (Uttar Pradesh), Nepal and Pakistan in the Palearctic (NILSSON 2012). GHOSH et al. (2011: 9) gave also "Congo", this is, however, no doubt a mistake.

Two males and two females were found in the same pool (Fig. 22) as *Laccophilus sharpi* and *L. flexuosus*, together with several *Hydroglyphus angularis* (see above) (Fig. 23; asterisk). To our knowledge a photo of the habitus of this species has never been provided before (Fig. 15).

This is the f i r s t r e c o r d from Iran.

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Zusammenfassung

Im Jahr 2010 hat I. Darvishzadeh im Westen des Iran (Provinz Khuzestan) Dytisciden gesammelt, im Jahr 2011 V. Pešić im Südosten des Irans (Provinzen Hormozgan sowie Sistan & Baluchestan) Wassermilben (Acari), wobei aber auch Insekten – insbesondere Wasserkäfer (Hydradeephaga)

erbeutet wurden. Unter letzteren befand sich der erst kürzlich beschriebene *Glareadessus franzi* WEWALKA & BISTRÖM 1998, gesammelt mit Hilfe einer Pumpe im Untergrund des Randbereichs zweier Flüsse in der Provinz Hormozgan. Von dieser Art war bisher nur der männliche Holotypus bekannt. Die von Pešić gesammelten Exemplare sind die ersten bekannten Weibchen der Art. Die zweite Art der Gattung ist *G. stocki* WEWALKA & BISTRÖM 1998, bekannt von zahlreichen Exemplaren aus dem Oman und den Vereinigten Arabischen Emiraten. Die weiblichen Genitale beider Arten werden hier zum ersten Mal abgebildet. Außerdem wird der Habitus beider Arten mit Farbfotos erstmalig illustriert. Die DNA von *G. franzi* wurde vom Kollegen I. Ribera (Barcelona, Spanien) untersucht. Einige Ergänzungen zu den Originalbeschreibungen der Morphologie beider Arten werden ebenfalls gegeben. Drei weitere Hydradeephaga können erstmals aus dem Iran gemeldet werden: *Hyphoporus solieri* (AUBÉ 1838), *Laccophilus flexuosus* AUBÉ 1838, und *Canthydrus laetabilis* (WALKER 1858). *Hygrotus orthogrammus* (SHARP 1882) wurde zwar bereits aus dem Iran gemeldet, seine Artberechtigung dürfte aber noch recht unbekannt sein; er wird deshalb ebenfalls angesprochen. Die Habitus der letzteren vier Arten werden illustriert sowie eine Verbreitungskarte und Fotos einiger Sammel-Lokalitäten wiedergegeben.

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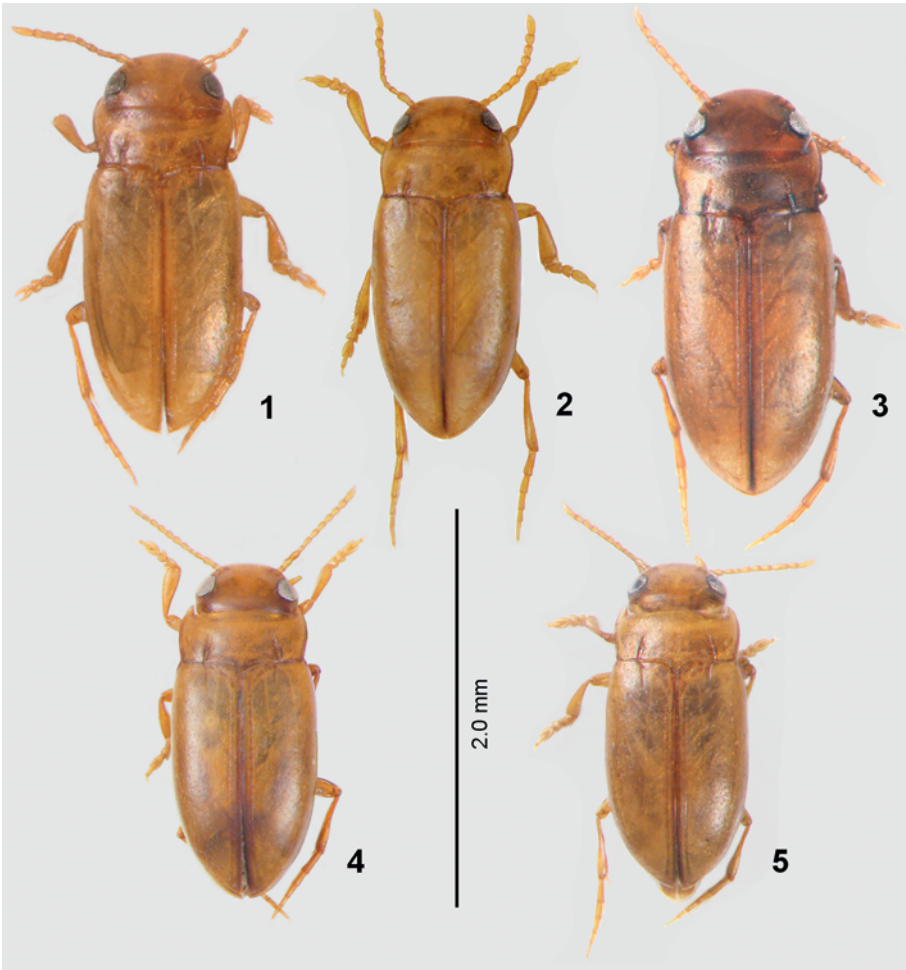
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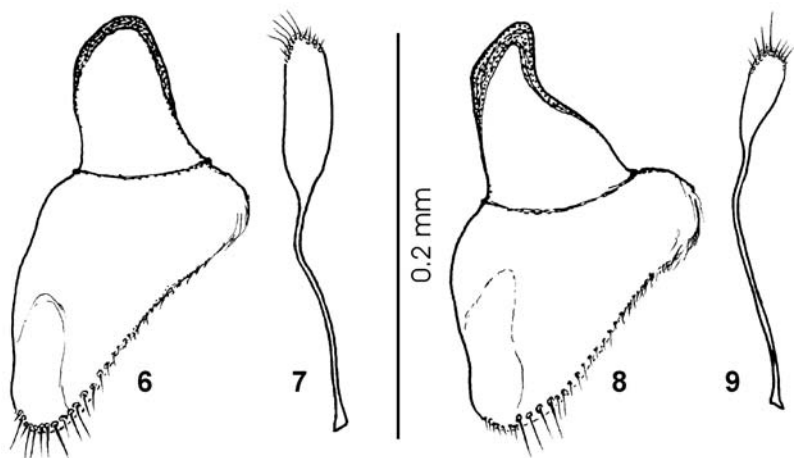
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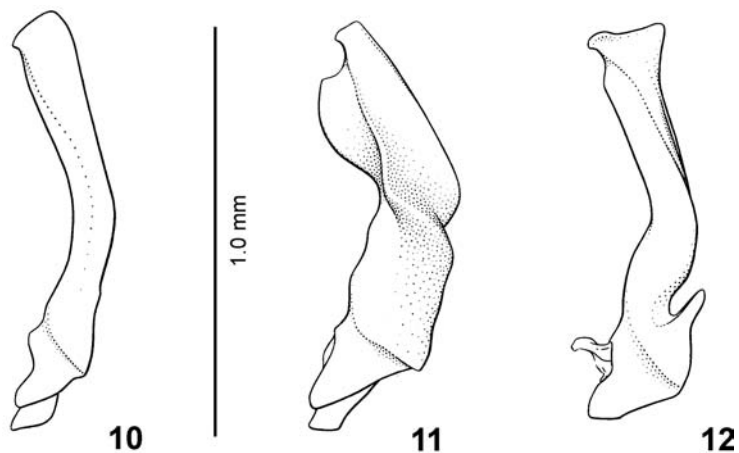
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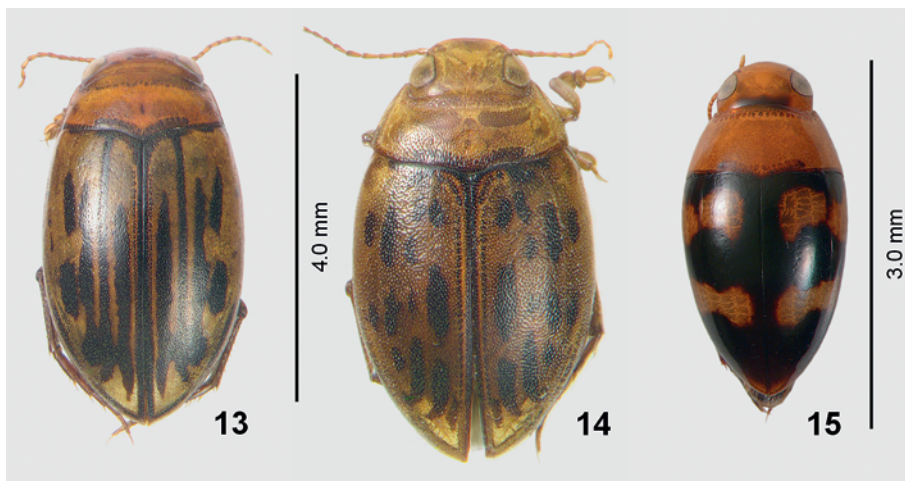
Figs 1-5: Habitus of (1) *Glareadessus franzi*, male holotype, (2) female from Rudan, (3) female from Banglayan; (4) *G. stocki*, male, (5) female; both specimens from Wadi Madaq, UAE.



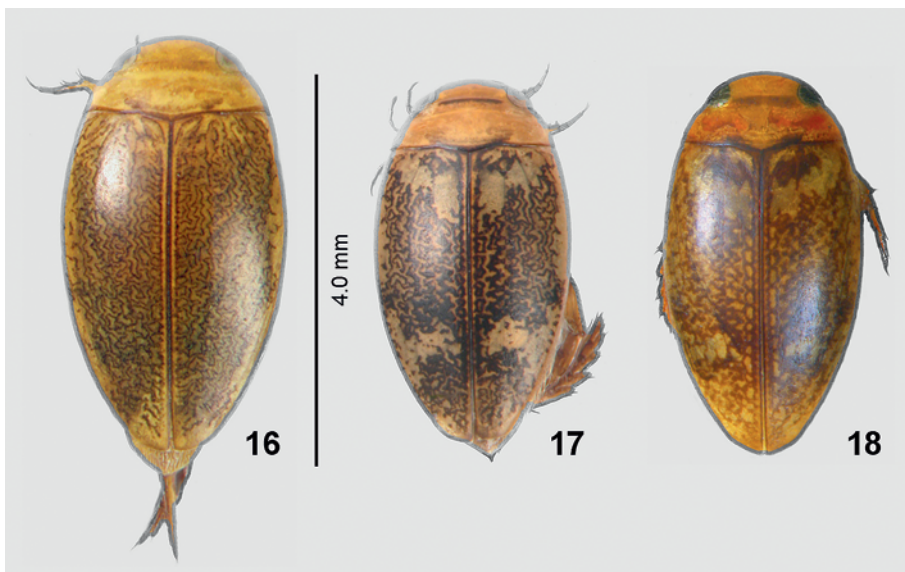
Figs 6-9: Female genitalia of *Glaredessus franzi* (6) gonocoxosternum, (7) gonocoxa, and of *G. stocki* (8) gonocoxosternum, (9) gonocoxa.



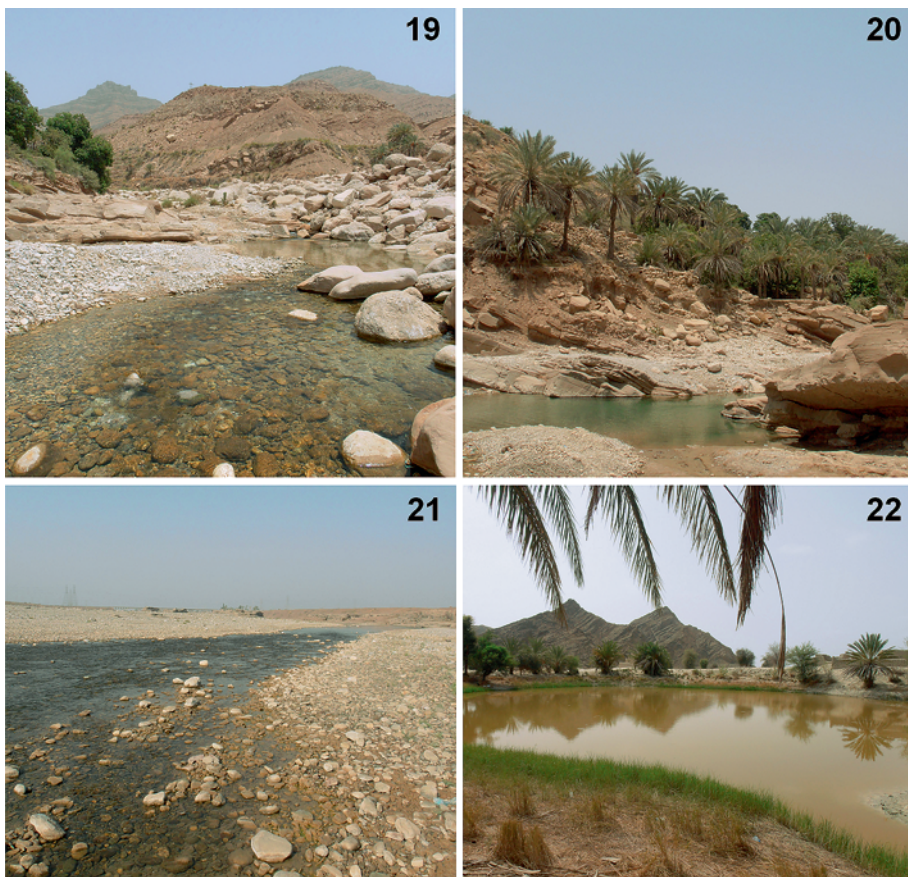
Figs 10-12: Median lobes in lateral view of: (10) *Laccophilus flexuosus*, (11) *L. sharpi*, (12) *L. poecilus*. These figures are reproductions from the figs 180, 183 and 194 in BRANCUCCI (1983). In this work *L. poecilus* is given under the name *Laccophilus obsoletus* [misidentification of *Haliphus obsoletus* WESTHOFF 1881].



Figs 13-15: Habitus of (13) *Hyphoporus solieri*, (14) *Hygrotus orthogrammus*, (15) *Canthydrus laetabilis*.



Figs 16-18: Habitus of (16) *Laccophilus flexuosus* (specimen from Guerduig), (17) *L. sharpi* (specimen from Guerduig), (18) *L. poecilus* (specimen from Repetek, Turkmenistan).



Figs 19-22: Collecting sites of *Glareadessus franzi*: (19) and (20) river at Rudan (Hormozgan provinzi), (21) river at Banglayan (Hormozgan provinzi); of *Laccophilus flexuosus* and *Canthydrus laetabilis*: (22) pond at Guerduig (Sistan & Baluchestan province).

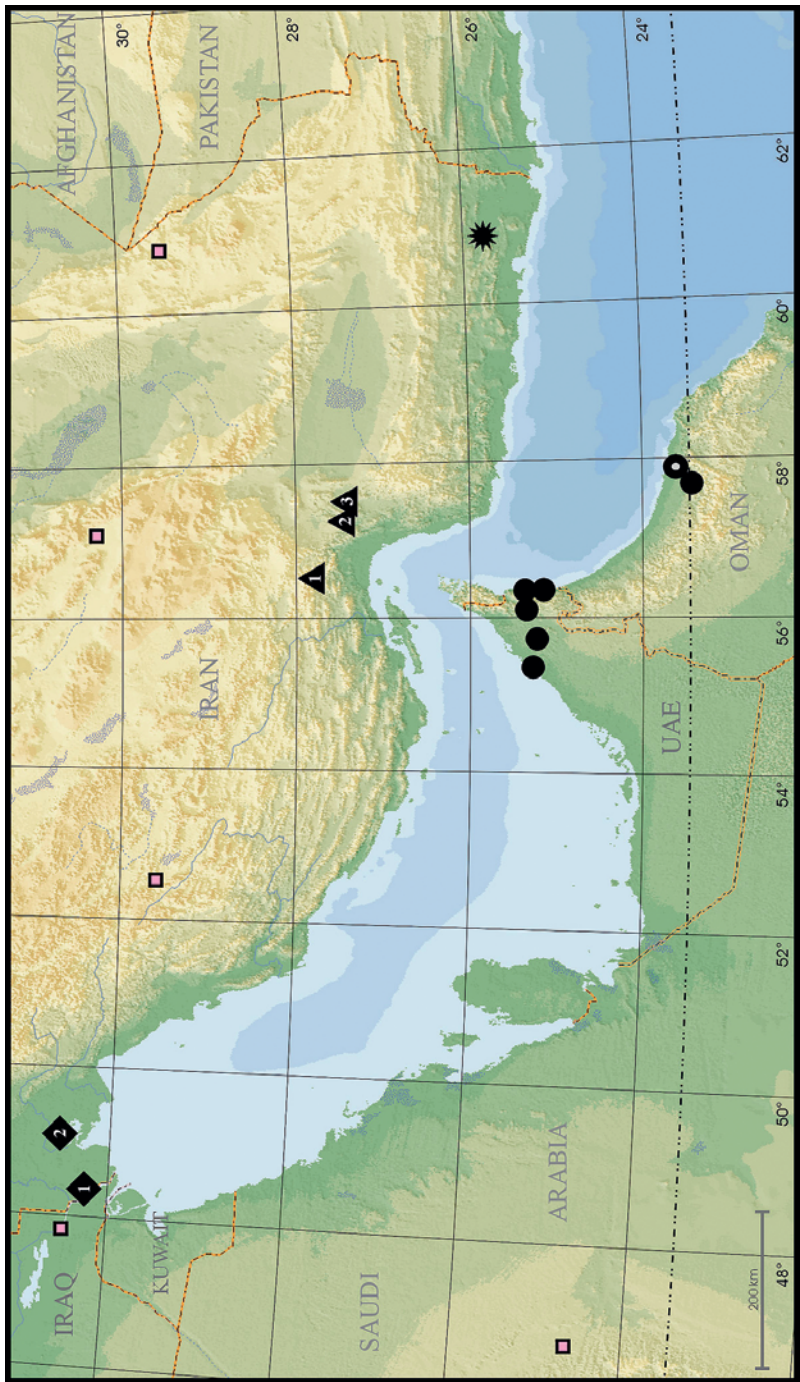


Fig. 23: Map of the study area: collecting sites of: *Hyphoporus solieri*: square (1), *Hygrotes orthogrammus*: square (2); collecting sites of *Glareadessus franzi*: triangle (1) – Bangluyan, triangle (2) – Rudan, triangle (3) – locus typicus; collecting site of *Canthydrus laetabilis* and *Laccophilus flexuosus*: asterisk; collecting sites of *Glareadessus stocki*: open circle – locus typicus, filled circles – other records given in WEWALKA & BISTROM (1998) and HAJEK & BRANCUCCI (2011). Red squares indicate important cities.